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It's not that Jupiter rose over Saturn and the ascending moon crossed paths with the sun to upset the calendar on the cusp of Sagittarius, but a congruence of events conspired to delay this issue of SOLPLAN REVIEW.

We try to maintain a regular publishing schedule, but it doesn't always work out that way, so observant readers will have noted that their November issue is arriving late due to a variety of production delays. We will try to catch up to our regular publishing schedule in the near future. RK.

Stucco Problems

From the Editor . . .

We pay attention to the quality of the housing we produce. Quality means attention to all details, not just the finishes and trimwork but also the construction behind the skin and all equipment we install. Good design is not just skin deep - the way it looks at first glance but also how it is put together and how it performs.

This means that we have to consider the components and appliances we use in our homes. Hopefully, product manufacturers will help by developing quality products. Unfortunately, too often they don't deliver.

When was the last time you were asked by a manufacturer for your opinion about their products? Or if there were improvements you would suggest? Some manufacturers have lost sight of who their customers are! Too often they would have you believe that good design is an expensive proposition. However, good design is not a mega-buck exercise, but a deliberate effort to analyze the intent and use of a product, so that it does what it is supposed to do efficiently. Product enhancement and upgrading can be an ongoing effort.

I was disturbed when a major fan manufacturer's representative visited with their catalogue update. When I asked about a good quality range hood fan for which I am in the market, he pointed out his offerings. The first thing I spotted was a noise rating of 5.5 and 6 sones (for their best units!). It's no wonder people don't use their range hoods. Who wants to put up with an unholy racket when they are cooking dinner or toasting their breakfast?

On questioning why they could not offer a quieter fan, I was told it was impossible to produce one, it would be too expensive, no one would buy them etc. The story changed somewhat when I pointed out that I have seen and heard quieter fans, but in Europe.

Suppliers must learn not to try and snow their customers, but to be honest about their shortcomings and, hopefully, to improve their products.

We are constantly told that the marketplace is a wonderful and responsive agent. Yet too often it is flawed, as buyers are not aware of what is possible until they are shown a product. We don't always know what the alternatives are. That is why demonstration homes featuring new products and technologies are a good idea, as they help to educate the marketplace (the home buyer as well as the building industry) that they don't have to put up with just anything, but that there are alternatives.

Richard Kadulski,
Editor

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Stucco Finishes

"Stucco" is the widely accepted terminology for an exterior Portland Cement plaster wall cladding. It is one of the oldest and most universally used exterior finishes. Properly applied it is a durable, practical and economical finish. However, when it's not installed properly, it can be the source of major problems - like rot, structural deterioration, and much more.

How bad it can be when done incorrectly can be seen in the claims files of New Home Warranty Programs. Recently in B.C. there have been a rash of failures in new buildings. The main problem has been water infiltration through the stucco and into the building structure, caused by improper application practices and /or improper materials being used.

Exterior sidings like wood, vinyl, metal or even brick are installed as a rain screen. Siding materials don't have to be sealed on the surface, because even if water gets behind the surface, it will run out and eventually dry out, with minimal structural damage. However, stucco is a face sealed finish. In other words, it must be perfectly sealed on the outside face to perform well.

As we know, weather can be harsh on materials and seals, so no matter how good a seal, they will deteriorate over time.

The key to a proper installation is to follow good installation practices. For Conventional Portland cement stucco, time proven practices must be followed.

In recent years, a number of new synthetic products using acrylic and fibreglass fibre compounds have been developed. These are all commonly referred to as acrylic stucco. Typically, such systems consist of: a cellular plastic material, a layer of synthetic resin modified Portland cement into which a fiberglass reinforcing mesh is embedded; and a coloured finished coat of a synthetic resin binder into which a mineral aggregate has been dispersed.

Synthetic stucco systems are thin membranes applied to an expanded polystyrene insulation base; others are membranes applied as a finish coat on a Portland cement base.

Although simple in concept many variables have to taken into consideration in the design of the system and the method and conditions of application. Special attention must be taken with environmental conditions such as temperature, precipitation, relative humidity and wind velocity. They can all affect the successful application of the colour finish coat of the system.

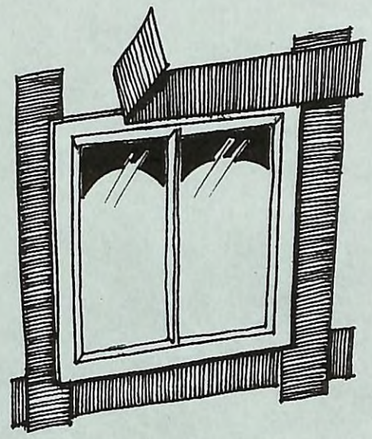
Regular exterior stucco contains cement and this cement causes the stucco to harden via a complicated chemical reaction mechanism. With Acrylic Stucco, these factors are far more critical since no cement is present to assist in the elimination of the water in the mix. The ambient temperature must be above 5°C until the system is completely dry.

If applied in strict adherence to manufacturers recommendations there should be few problems. It's when corners are cut that problems arise.

A common "acrylic stucco" application is a hybrid, using a resin top coat applied over a conventional stucco application, so its appropriate to review what that is.

A stucco application involves a number of components including the stucco membrane, lath, sheathing paper and sheathing.

The Northwest Wall and Ceiling Bureau and Association of Wall and Ceiling Contractors of B.C. have jointly published guidelines for stucco application. They are designed to provide the necessary details for a proper Portland Cement Stucco finish.

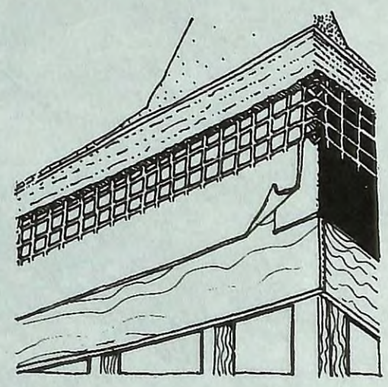


Building paper

Sheathing paper must be applied horizontally lapped (like shingles) at least 100 mm (4") at every lap of the sheathing paper. Improper sheathing paper installation is too common a problem - to often, the paper is installed backwards thus ensuring that water will penetrate into the structure.

Stucco Lath

Stucco lath (wire mesh) should be applied horizontally ensuring that the self furring lugs of the wire mesh are touching the wall to form a 6 mm (¼") space for the Portland Cement to fully embed the surface of the wire mesh. The lath must overlap at least 50 mm (2") at joints.



Joints must be staggered and all joints must occur over framing members.

Outside corners of the lath must be reinforced with a vertical strip of lath or reinforcing. When metal nose beads are used, the cement stucco should completely encase and embed the metal nose bead to prevent corrosion of any exposed metal.

Fasteners

Nails must be a minimum of 38 mm (1.5") long and penetrate at least 25 mm (1") into the framing members or to the full depth of the sheathing where the sheathing is used for attachment. Fasteners on vertical surfaces should be spaced not more than 6"o.c. vertically and 16" o.c. horizontally.

Application

Stucco must be applied with not less than 2 base coats and 1 finish coat. The total thickness of the stucco should be a minimum of 21 mm (7/8").

The first or *scratch coat*, must be at least 12 mm (½") thick, measured from the face of the stucco lath and completely embeds the lath. It is trowelled into the stucco lath, then scratched horizontally to form a mechanical key for the second coat.

The second or *brown coat* should be at least 6 mm (¼") thick. It should be applied after the first coat has set sufficiently. However, there is no consensus how long that should be; some suggest 7 days curing time between application of the first and second coats.

The Portland Cement Association recommends "the second coat should be applied as soon as the first coat is sufficiently rigid to resist without cracking the pressures of the second coat application." In any case the scratch coat should be cured for at least one day before the second coat is applied.

The finish coat is applied after the first two coats have been cured. However, what that curing time should be is not clear. During hot, windy and dry weather the stucco cement should be protected from excessive evaporation. Moisture must be kept in the stucco cement for the first few days after application to assist in the curing process, so the for curing time will vary with climatic conditions.

The finished coat should be at least 3 mm (1/8") thick.

When a stone dash finish is used, the stone should be partially bedded in the second coat before the second coat starts to set or stiffen.

These installation guidelines and practices have proven themselves over time. Its when short cuts are taken or new formulations used without attention to manufacturers' specifications that the problems arise.

Stucco Problems

The following are some of the common stucco problems that have been encountered in B.C. multi-family buildings recently. They are not unique to B.C. Some are made worse by the building design and detailing provided, others are simply sloppy installation practices.

Stucco

1. Inadequate number of coats of stucco
2. The thickness of the layers is too thin.
3. The strength of the stucco is marginal which can result in excessive cracking or water absorption.
4. The stucco is not allowed to cure properly between layers.
5. The stucco mix is porous, allowing water to migrate easily through the stucco.

Lath

1. The lath is not attached properly to the building (too few fasteners).
2. The stucco lath fasteners are installed in the wrong location and don't provide support for the lath.
3. The lath is not properly embedded in the stucco.

Flashing

1. Flashings are not properly installed over openings.
2. Counter-flashing is not provided at the junctions of horizontal and vertical surfaces.
3. Cap flashing is not provided or incorrectly installed on horizontal planes of railing walls, upstanding walls, and parapets.
4. No through wall flashing for large stucco areas.
5. The design of some "J" beads and control and joints allow water to drain inside rather than shedding it to the exterior.
6. No sealing of the joints in flashing and control joints.
7. No slope on horizontal railing surfaces, allowing water to pool.

Sheathing Paper

1. Sheathing paper beneath the stucco is missing.
2. The sheathing paper has been improperly applied/lapped and does not form an effective barrier between the stucco and the wall sheathing.
3. The sheathing paper has been damaged allowing water to infiltrate into the building.
4. The sheathing paper may deteriorate over time, thus creating an ever failing membrane between the stucco and the wall sheathing.

Design

1. Architectural design with inadequate attention to how weather/water protection is to be achieved.
2. Not enough consideration to the effect of normal shrinkage and deflection of framing on stucco.
3. Dissimilar building assemblies with little consideration to the movement and shrinkage of the assemblies and how they affect the stucco.
4. Inadequate or no venting of vertical cavities.

Other

1. Inadequate shrinkage gaps between wood sheathing.
2. Windows (unsealed mitre joints) may permit water drainage behind stucco.
3. Some wood sheathing products may excessively expand when subjected to excessive moisture, thus causing additional stucco cracking.

Insulating Glass Guide

Rapid advances in glazing technology, new materials and innovative manufacturing processes have made a wide range of insulating glass options available to today's specifier, builder and homeowner. Selecting the best glazing for a specific building project requires careful consideration.

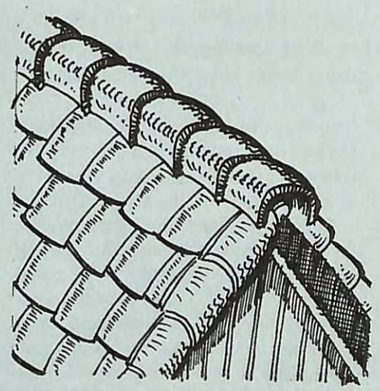
Willmar windows has just published **Insulating Glass Guide** an excellent 16 page booklet that provides basic information about insulating glass units used in windows and doors and outlines the differential advantages of various options. This publication provides a glazing overview, defines terms, explains how glazing can be used as a solar gain or solar shield, how to choose the right glazing, questions to ask when selecting glazing, and a glossary of terms.

It is meant as an aid in the selection of appropriate glazing for a new building or renovation project. Although prepared to assist their sales staff and customers, it is an excellent guide for any builder and it's not a "Hard Sell" piece either!

For a copy, contact your Willmar sales representive or :

Willmar Windows
Winnipeg, MB
Tel: (204) 668-8230 or
1-800-665-8438
Fax: (204) 663-1072

Used Tires: a New Roofing Alternative?



Old automobile tires are a problem that plagues all the industrialized world. It is estimated there are 2½ billion scrap tires stockpiled in the U.S.A. alone and increasing by over 20,000,000 per year.

Various attempts to find uses for recycled tire rubber are being made. The B.C. Advanced House featured one product that used re constituted shredded rubber tire materials for paving stones.

A low-tech rubber roofing system has been developed by Moore Enviro Systems of Squamish, B.C. They take advantage of the very qualities that make tires resistant to breakdown: their capacity to survive ultra-violet radiation from the sun and resist weathering and water. In addition, the tiles are 100% recycled tires.

Three-foot-long strips of tire (turned inside-out or used right side up) are used as roofing shingles.

This is good heat resistant material, as tires are made to withstand extreme amounts of heat and have a high ignition point (approx. 1000° F.) when compared to other roofing products: asphalt shingles, tar and gravel, shakes and shingles all ignite at approx. 400° F.

The manufacturer claims this product has a "Class C" fire rating, has high wind resistance, is moss resistant, extremely tolerant to damage from foreign objects, and can be used as a siding tile too.

The "tiles" can be painted in a wide variety of colours

This may not be the answer for everyone, but it is an innovative low-tech use of an easy to use resource.

Information:
Moore Enviro Systems Inc
Box 1459, Squamish, B.C.
V0N 3G0
Tel: (604) 892-2334
Fax: (604) 898-5683

Energy Efficient Panelized Building Design Competition

The Structural Insulated Panel Association (SIPA), the U.S. Department of Energy, Builder Magazine, and the National Renewable Energy Laboratory are sponsoring the second Energy Efficient Panelized Building Design Competition to showcase the best in energy-efficient and affordable buildings using structural insulated panels.

The categories for awards are commercial buildings, residential buildings, and residential or commercial building designs and winning entries will receive cash prizes. Judging will be based on energy conservation performance, technical innovation, architectural distinction and affordability.

For an entry package or more information, contact:
Shari Bush, Executive Director of SIPA, 1511 K St., N.W. Suite 600.
Washington, D.C. 20005
Tel (202) 347-7800

Efficient Ventilation Equipment: Why We Don't See More?

by Richard Kadulski

Are existing ventilation technologies and installation practices capable of satisfying the new goal of maintaining good indoor air quality? In many cases the answer is a clear "No".

Changes to building codes, construction practices and a greater awareness of indoor air quality means an increased use of mechanical ventilation in housing. Unfortunately, most equipment used today is terribly inefficient and has high operating costs because the electrical energy used is much more than required. The longevity, noise and vibration levels of most devices is unsatisfactory, so many homeowners don't want to use the fans.

A majority of kitchen range hoods in Canada are not used because occupants find they are too noisy; to make matters work, exhaust fans typically move only 50% of the manufacturer's rated air flow, the rest is lost to leaky ducts. Many bathroom fans have an expected life span of 3500 hours (only 5 months if operated continuously).

Is energy efficiency of ventilation equipment important? Analysis of life-cycle costs of typical residential ventilation systems indicates that energy efficiency could be very cost effective, simply because current equipment is so inefficient. First costs have been shown to be a poor basis for making choices. However, accurate estimates of life-cycle costs are difficult to calculate because we don't know how long people will run the fans and how soon they will be replaced- both important variables.

The present cost of operating an air exchange system could be in the order of a hundred dollars a year. However, the continuous operation of a forced-air furnace blower, for comfort and air filtration, may add many hundreds of dollars per year to operating costs. Both are many times higher than they should and could be, but neither the consumer nor industry are aware of the costs or possible savings. Improving the efficiency of ventilation equipment will require developing a standard for testing and rating the air moving efficiency; creating a process to establish limits and targets; making them enforceable by codes and regulations; and developing methods for verifying compliance.

The technical potential for improving ventilation systems is known. To find out why changes are so slow to come, a study[1] was done to find out what key industry players see as the barriers to the availability and use of more energy-efficient residential ventilation equipment.

Respondents claimed to be aware that most residential ventilation devices are extremely inefficient, but most did not have a good understanding of the science or the implications of those inefficiencies.

the largest and best financed residential ventilation equipment manufacturers don't seem to have any innovative spirit or drive.

Air-moving efficiency (how much power it takes to move air, compared to how much is used to perform the task) was often confused with heat recovery efficiency (how much power it takes heat or cool the air, compared to how much is available in exhaust or intake flows).

Several respondents strongly argued points that are at odds with scientific opinion. Others argued that energy efficiency, itself, is irrelevant; but that concern should be directed towards functional design, total energy consumption or heat recovery losses. Those factors are important, of course, but not to the exclusion of energy efficiency.

Opinions about the potential for technical improvements varied widely. Apparently no common understanding exists about the kinds of technical changes that are possible, desirable or effective. Responses tended to focus on one or two types of devices (bathroom fans, range hood fans, heat recovery ventilators, forced-air circulation motor-blowers, or central exhaust fans, and so on) rather than the controller, motor and fan sets themselves. The most commonly cited improvement was a change to a permanent split capacitor motor from the present shaded pole variety used in bathroom and range hoods, and to higher efficiency motors for forced-air systems.

Industry plans for change appeared to be poorly defined, with the notable exception of the work by Ontario Hydro and General Electric on replacing furnace blower motors with higher efficiency units.

Few considered the cost of operating ventilation fans to become a major issue in the near future.

Since the trend is towards more integration of mechanical systems in houses, any strategy must address the variety of tasks or services a residential ventilation device contributes.

It is discouraging to note that the largest and best financed residential ventilation equipment manufacturers don't seem to have any innovative spirit or drive.

The major problem against higher energy efficient equipment is the consumer's emphasis on first cost. The other big problem is that the decision makers, those who specify and purchase equipment don't usually bear the costs of poor efficiency.

Doubts were expressed about the potential for education of householders or influencing manufacturers without more research and planning. A suggestion was made that an information guide for distributors of equipment is more important than for the trades. Training should start with system design and energy efficiency, not motors and fans. It was suggested the

Continued on page 7

Effective Ventilation

by Richard Kadulski

Ventilation is for people. First and foremost ventilation must provide fresh air for the health needs of the residents and not to remove pollutants generated by construction or household furnishings. This is often forgotten in the discussion about how and how much ventilation to provide.

Most codes and regulations merely state that it is necessary to supply a quantity of air - and that's it. But how do we know that the ventilation will do its job, specially if there are few compliance checks made?

The Swedes have mandated ventilation regulations for much longer than most other jurisdictions - they even have inspectors to check ventilation systems. However, they have noted that even this does not guarantee good air quality.

How much air is needed?

The minimum required air change is considered to be about 4 m^3/person per hour, so that a master bedroom needs a ventilation rate of about 6.9 l/s (14.6 cfm) assuming two adults and one child sleep there.

Swedish ventilation standards call for an air exchange rate of 0.5 air changes per hour, which is an appropriate measure for their smaller houses. However, a study[1] found that those ventilation rates don't ensure acceptable air quality in all rooms, especially in bedrooms.

The basic ventilation system was a central exhaust fan with exhaust grills in bathroom, closet and kitchen, with fresh air supplied through passive air intake devices (slot vents in the window frames in all bedrooms, and living room). The slot vents have only two positions: fully open and half open, a common ventilation strategy used in Sweden.

A number of tests were done, simulating normal operating conditions on a new moderately air tight house (less than 3.0 ACH at 50 Pa). Total air volume of the two-storey houses tested were 300 m^3 (equivalent to a 1320 sq. ft. house without basement).

Measurements showed that better indoor air quality would be achieved if the bedrooms had exhaust as well as supply grilles. Installing an exhaust in the bedrooms is simple and inexpensive and also allows for a reduction of the house's total air exchange to about 0.3 changes/hour which can result in sizable energy savings.

The air change in the master bedroom (with the exhaust fan set at 0.5 AC/H for the whole house) was 2.2 l/s (4.6 cfm) with the slot vent partially open and 5 l/s (10.6 cfm) with the slot vent fully open. The air change *decreases* if two second floor windows are open. (The average decrease was about 35%).

As the intent of ventilation is to maintain good air quality, measurements of relative humidity and CO_2 concentrations were also taken. When the passive air intake slots were partially closed, high humidity and CO_2 levels were measured, but when the slots were opened, there was enough airflow to keep levels below acceptable limits, even when the total exhaust rate was decreased but when exhaust was also taken from the bedroom.

What does this tell us?

Just because a ventilation system theoretically provides enough air into the house, there is no guarantee that fresh air will be properly distributed to those areas where you want fresh air. The master bedroom is typically the most critical room to consider because you have two people spending the most amount of time, (and generating pollutants) usually with the door closed, thus providing the most difficult conditions for mixing the house air.

If a ventilation system is carefully designed it can provide a quality indoor air environment at a very small energy cost. It is not necessary to rely on large quantities of airflow if we can provide quality.

It also shows that an exhaust only system with passive ventilation inlet grilles can maintain good indoor air quality. This is a ventilation strategy that may be difficult to use if the proposed changes to the 1995 National Building Code are adopted.

This study under scores the need to be open to a variety of ways of attaining good air change. Codes should be left sufficiently flexible to allow for a variety of solutions to ventilation needs.

[1]Air Quality in Low-Density Housing, A Study of Requirement Adapted Ventilation by Arne Lojdberg and Anders Adling, Swedish Council for Building Research, 1986.

Continued from page 6

energy utilities should help to fund the process of developing inspection procedures and skills at the field level.

A significant comment made was that the entire industry, including the standards writing groups, is preoccupied with energy and capital costs issues and not to health costs. In fact, the health lobby is non-existent.

It's no wonder it's hard to determine what is appropriate, or to find good equipment!

1 "Barriers to the Use of Energy Efficient Residential Ventilation Devices: A Survey of Industry and A Review of Strategies for Change"
Prepared for: Canada Mortgage and Housing Corporation by Sheltair Scientific Ltd.

Ventilation Inspections

Poor indoor air quality has been identified as a cause of health problems. We now understand that unhealthy substances are given off by various building materials and furnishings. Moulds and general air pollution are also contributing factors.

In general the most important way to remedy the problem is improved ventilation. However, poor upkeep and maintenance leads to a decline in the performance of a ventilation system. Defects are often simple to remedy; it may be as simple as changing a filter or fan belt or cleaning a dirty ventilation unit. Well managed systems increase the life-span of equipment and lower operating costs; more importantly, they improve the health of the environment for work or residence.

While ventilation is a technical and building issue, there are serious public health consequences. The building industry is lucky that so far this connection has not been made, otherwise, the health lobby would be pursuing it like the environmentalists are the mining and forest industries.

In Sweden it is estimated that about 30% of the population suffers from hypersensitivity or allergies of some sort. That is why the Swedish Parliament recently unanimously agreed to introduce regulations for the compulsory inspection of ventilation systems. The compulsory inspections are based on the power in the Building Act and Work Environment Act. They both apply to a good indoor environment and the owner of a building is responsible for ensuring this.

For a new installation, the inspection verifies that current regulations are observed, that drawings and design documents have been followed, that the ventilation system is correctly adjusted and that it works in a satisfactory manner.

The ventilation system inspection looks at the operation and maintenance instructions, air change rates, humidity conditions, fans and air handling units, recirculated air, deposits in ventilation ductwork, and radon. When inspecting an existing installation in an older building the inspector must check that it conforms to the regulations in force when the system was built and that the system, in general, operates in the way intended.

The only exemptions to this new inspection are single family and semi-detached dwellings with natural (passive) ventilation, and detached and semi-detached dwellings with only mechanical exhaust air ventilation.

Inspection frequency

The schedule for inspections depends on the type of building occupancy. For day-care centres, schools, health care centres, etc. it is every 2 years; for apartment buildings and office buildings with balanced ventilation systems it is every 3 years; for

apartment and office buildings with Mechanical exhaust ventilation it is every 6 years. One and two-dwelling houses with balanced ventilation system (i.e. HRV's) will be inspected every 9 years.

The inspection report is sent to both the property owner and the municipality, and a special certificate is issued after an inspection .

What has been the experience so far?

In spite of a strong initial resistance against this inspection, now almost all building owners admit that it was necessary. Operation and maintenance instructions are often found to be lacking. The ducts are often very dirty, with reduced air flow rates and imbalances in the ventilation systems.

The problems of badly performing ventilation systems are not unique to Sweden. Until more people realize the relationship between the built environment and health, this kind of regulatory approach will not be seen here. Then again if builders, renovators, designers and specifiers pay more attention to the products and systems they use in buildings, there may not be a need to take this sort of action.

Adapted from the Air Infiltration Review. "Checking the Performance of ventilation systems, General Guidelines from the Swedish National Board of Housing"

Air Sealing Handbook

The importance of air sealing buildings has been recognized for sometime. How to achieve it is another matter.

A new handbook that will be useful for new builders as well as seasoned builders is **Advanced Air Sealing: Techniques for Air Leakage Control in Residential Buildings.**

This is an application manual that translates research into practical, usable text and graphics that can be understood and implemented by builders.

Forty pages and forty-one illustrations present simple techniques and tips for sealing floor/wall and floor/ceiling intersections as well as six options for sealing rim joists and four options for dealing with recessed lights.

The Advanced Air Sealing manual is available for (U.S.) $15.00 from:
Iris Communications,
258 E 10th Ave #E, Eugene Or
97401-3284
Tel: (503) 484-9353.

HOT-2000 Version 7.0

HOT-2000 is a computer program designed for low-rise residential buildings that was developed for use by the R-2000 Program, as a design and compliance tool. Since the initial version (known as HotCan) it has seen significant upgrades. Version 7.0 is the latest edition and it will be the only accepted version for compliance to R-2000 in early 1995.

The software has progressively got more elaborate and complex, while also getting more accurate. A number of technical upgrades have been incorporated in the performance models to aid in the simulation and design of buildings for thermal effectiveness, passive solar heating, and the operation and performance of heating and cooling systems. Three zones are now simulated: the main portion of the house, basements (which often are operated at a different temperature) and the attic space, which is a buffer between interior and exterior.

HOT-2000 lets you input comprehensive data for a proposed building design, analyze the expected heat loss/gain (including cooling loads), and revise and test alternative designs to achieve a satisfactory design.

The most significant change is that the true R-values of all construction assemblies are modeled rather than just nominal R-values. This can be a big factor in the performance of a building (see Solplan Review #58). Construction assemblies can be built-up as they are entered, or from a user defined data base that can hold up to 16 user defined elements.

Another significant change is the modification of the front end. It features a pull-down menu system and you can also select the components to be evaluated when you open new files, rather than having to go through all possible elements. An editing screen now allows for viewing of previous/next screen; and saves to disk at any point in the entry. In earlier versions you had to go through the entire input procedure before you could exist a data file.

Other features include:

- the calculation of a standard ER value for each of the window types defined by the user;
- the ability to make comparisons of energy consumption, costs and other data for up to 4 house data files at one time;
- either imperial or metric units
- models slab-on-grade foundations, both shallow-depth and full-depth basements;
- models open, closed (sealed) and ventilated crawl spaces, including transient heat flows to the earth;
- simulates a primary and secondary water heating system combination or a solar DHW heating system;
- calculates cooling loads;
- includes a fuel cost editor feature for establishing utility rates;
- calculates design heat loss to size the space heating system.
- allows user to define type of print-out needed.
- does not require an area calculation to be done for all components prior to inputting, as it accepts length and width dimensions.

HOT-2000 v 7.0 is a powerful and more accurate tool. A lot of accurate detail is now needed before you can use it, so that it may be time to consider a simplified version that is more user friendly for quick calculation. After all, as we often forget, computers are basically dumb machines that are only as good as the input provided.

HOT-2000 is so large now that it's absolutely essential to run it on a machine with a math co-possessor. For most newer computers this should not be a problem, but if you are still happily using an older 286 or 386 machine without a math processor, then either forget about this version as it will take up to 15 minutes to do a calculation (compared to 5 to 15 seconds) or else it's time to upgrade your equipment.

Because the program now calculates the true R-value of a building component, it contains a large data base. Unfortunately, in order to simplify the structure, the developers have used a single data base menu for all types of elements so you sometimes see materials on the list that don't make sense for a given component (e.g. batt insulation for a basement floor).

For most components, the construction is easy to define but occasionally there are lapses (there is no provision for R-40 batts in the drop down menu for ceiling insulation). In those cases, you have to edit or create your own component.

For easy use, I've found it much easier to create a library of common construction assemblies first, it speeds up the process. But be warned - you need quite a bit of information on the construction products before you can create a file (thickness, R-value per inch thickness, etc).

The manual, is comprehensive, but it doesn't always provide an explanation easily - you either have to search for the answers or may have to make assumptions.

HOT-2000 v 7.0 is available in IBM format (minimum 520K bytes of RAM for the MS-DOS version) or Macintosh format (minimum 1200K bytes of RAM and a system version 6.0.7 or higher). Canadian version is $295.00 plus taxes; US version US$325.00

Information or more details:
HOT-2000 Sales
Canadian Home Builders' Association
Suite 200, 150 Laurier Ave West
Ottawa, Ontario, Canada
K1P 5J4
Fax: 613-232-8214

A limited number of copies (Canadian weather data version) are available from Solplan Review.

Letters to the Editor

Re: Passive solar heating

(Solplan Review No. 57)

The Ontario R-2000 Technical Committee was pleased to note that you were taking the opportunity to promote passive solar heating. To further the dialogue and spark some debate we would like to raise the following points:

1. The inability of designers and builders to adequately respond to simple rules dealing with proper window selection, orientation, thermal mass, overhangs and distribution of solar heat among other things has prompted many manufacturers to introduce new glazing systems that effectively elimates (minimizes) solar gain, much the same as took place in the commercial sector. This new generation of glazings have a high visible light transmission with a low solar heat gain which previously could only be achieved through reflective films of dark tints resulting in reduced daylighting. This is an alarming trend that is often marketed under the guise of an energy efficient feature depending on your cooling load.

2. Many of the same rules that apply to successful passive solar design can also be applied to successful use of a wood or gas fired space heater/fireplace: location of appliance, location of chimney, mass, sizing, distribution of heat, operation and maintenance.

3. We are concerned about the lack of information available to builders and renovators about the condensation resistance of windows, an important factor in consumer satisfaction. The term "condensation resistance" is missing from our window buying vocabulary, at our peril.

The biggest homeowner complaint regarding new homes is condensation on windows. The solution within the code has been to require the capacity for mechanical ventilation. An argument could easily have been made that, in addition to ventilation, window manufacturers should be required to improve the resistance of their windows to condensation. In the U.S. all windows are sold advising the builder/homeowner of the point at which their windows will experience condensation. The CSA A440 standard has an optional test to determine the condensation resistance of a window but if builders don't ask for it why would a manufacturer pay the extra costs associated with this test? In the absence of this information being available the R-2000 technical requirements for Ontario will require that operating windows have an ER of -13 or better and fixed windows an ER of 0 or better when tested in acccordence with CSA 440.2.

4. Consideration is being given to adding a renewables pick list to the R-2000 technical requirements in Ontario, of which one of the options would be 40% passive solar as determined using HOT2000 (other options would include solar DHW, photovoltaics, wind generator or EPA certified woodburning appliance; one to be chosen).

Tex McLeod
Toronto, ON

Re: Total Thermal Resistance Values

(Solplan Review No. 58)

As the owners and inventors of "Insul-Wall" we are somewhat confused by the table on wall insulation values (Total Thermal Resistance Values, page 7, Solplan Review No. 58). We wonder why 3" EPS was used in the comparison and also why it was combined with R8 batts. Insul-Wall is produced in 5" and 7" only and is not used in connection with batts. The purpose of Insul-Wall is to provide an alternative for batts which we believe to be an inefficient method of wall insulation. There have been a number of attempts to copy our product and perhaps this application has been used in some similar form by a competitor, but to the best of our knowledge Insul-Wall has never been produced with 3" EPS.

It would be appreciated if perhaps you could clear up any confusion that may have arisen from this article.

Eric C MacNearney, P Eng
President & General Manager
Truefoam Ltd
Dartmouth, NS

We've received several comments on the Insulation Thermal Resistance Values story. The framing system labelled "Insul-wall" was, indeed an error. The system referred to was a generic configuration of 3" EPS offset on wood framing. This would be not unlike the Super-lock system used in the BC Advanced House, with the cavity providing space for services, and filled with batt insulation. The system as modelled is not being manufactured

Another reader pointed out that rigid fibreglass (Glasclad by Owens-Corning) has a listed R value of 4.5 for a 1 inch thickness, although their rigid fibreglass products used in commercial applications have lower R-values.

Insulation values differ according to the manufacturer and product specifications. It's possible to look microscopically at the properties of various products and indeed that has to be done to establish ratings. However, in the field poor installation practices or lousy details can degrade the value of the insulation very quickly. The point we wanted to highlight in the story was that there are many ways of meeting a desired insulation value, especially when thermal bridging is taken into account. RK

Technical Research Committee News

Canadian Home Builders' Association

Chimney Venting Failure

Chimney flue failures cause a number of deaths every year. Rccently a number of highly publicized incidents were caused due to corroded A vents, which failed when ice built-up between the walls of the flue liner and the outer flue crushed the flue shut.

The Saskatchewan Research Council is doing research into the whole issue of chimney performance. They are looking for anyone interested in participating in the study.

For more information, contact Rob Dumont at SRC (306-933-6138) or Ross Monsour at CHBA in Ottawa (613-230-3060).

Residential sprinklers

Mandatory residential sprinklers are still being aggressively pursued by many fire departments. Unfortunately, they usually play on the emotions of municipal politicians rather than allowing a reasoned discussion about technical issues and risk assessments. A study is now underway for CMHC that is looking at all the costs and benefits of sprinklers in residental applications, and especially the impact on municipal infrastructure costs.

In the meantime, the Advisory committee on Part 3 of the 1995 National Building Code (the section that applies to multi-family and commercial buildings) has approved inclusion of mandatory sprinklers requirements for all residential buildings built under Part 3.

The National Building Code is a model code that is used by the provinces as the base for their codes, so that it is quite likely that this will be incorporated into provincial codes in the next review within the next year or two.

It would be appropriate for builders in all communities to be pro-active with their local municipal governments. For assistance or to obtain a sprinkler document action package contact the TRC.

Indoor Air Quality Data Base

The importance of maintaining good indoor air quality has been recognized. It has also been recognized that the best way to achieve better indoor conditions is to avoid using products inside that have significant emissions, rather than trying to flush out the air in the house at ever higher air flow rates.

The dilema for the builder and designer is to know what products have low emisions and can be safely used indoors. A database of products, needless to say, is a sensitive issue as those manufacturers of products that have high emissions will fight to maintain their market share. In addition, the wide range of products and chemicals in use today makes it difficult to simply categorize good and bad products. So what is the builder to do?

Work is underway by NRCan, CMHC and other agencies to develop a data base that can be easily accesed to determine the impact of various products.

The hope is to develop a spreadsheet where one would enter the amount of each material used, the house size and ventilation rates. The calculations would provide an answer givng the approximate chemical concentrations that could be expected in the house shortly after installation, and six months after.

Basement Research Project

We've developed many building enveope systems largely through a process of trial and error. When a system seems to work well, and is widely used, it becomes the accepted norm and may even be incorporated in the building code. Only recently have we begun to understand how and why some of those systems work.

In recent years we've begun to fully insulate basements. Many new systems have been used with varying degrees of success. In the past foundations were built with concrete or masonry and little else. Today we see many innovative systems that may or may not include insulation as formwork, wood, precast concrete, steel, etc. While many systems are being tried, most succesfully, there are enough problems in some areas to merit a review of just what are the performance requirements of basement envelopes. In other words not how they should be built, but rather what must a system do to work properly.

That is why a project is being started by an industry consortrium to develop performance guidlines for basement construction. It will look at heat loss; air leakage and soil gas entry; moisture (from outside air, groundwater, and construction); rain water; heaving; shifting and cracking; and materials durability.

Anyone who would like to participate, or get more information should contact Ross Monsour at the TRC.

The Technical Research Committee (TRC) is the industry's forum for the exchange of information on research and development in the housing sector. To contact the TRC:
Canadian Home Builders' Association,
Suite 200, 150 Laurier Ave. West, Ottawa, Ont. K1P 5J4
Tel: (613) 230-3060 Fax: (613) 232-8214

EnviroHome

Extensive research and development has made Canada the world leader in residential construction technology. To keep that leadership and to encourage a wider application of environmentally friendly technologies, the Canadian Home Builders' Association and Canada Trust supported by Canada Mortgage and Housing Corporation and the R-2000 Program have teamed up to sponsor the EnviroHome program.

This is a promotional event to showcase new homes that offer balanced benefits to occupants, the community and the natural environment. The EnviroHomes are environmentally improved houses built to the R-2000 Standard. They are meant to showcase affordable and currently available products and innovations that can help protect the quality of the environment-indoors and out. Two pilot projects - in Edmonton and Saint John, NB are now open.

Environmentally Improved Products

Materials used include resource efficient products. These include a wide range of manufactured wood products from waferboard to laminated wood composites and engineered structural components which results in far more efficient use of forest resources and reduces the need for large dimensional lumber for framing.

Recycled Materials

Materials with recycled content available today include cellulose insulation manufactured from recycled newspapers; fibreglass insulation that contains post consumer waste glass; mineral wool insulation made from the waste products of the mining industry; carpeting produced from empty plastic soft-drink containers; drywall with recycled gypsum; and concrete produced using the waste fly ash from coal-fuelled boilers.

Indoor Air Quality

The air quality in a home affects the health and comfort of occupants. Recent health studies show that the incidence of allergies among Canadians over 15 years of age has increased by 40% between 1978 and 1991. During the same period the incidence of asthma rose from 2% to 6%. There are three main factors that affect the quality of air in a home:

Pollutants are released by all materials used in building the home, including products such as synthetic fibres used in carpets and furniture, glues in some manufactured wood products, some types of synthetic flooring and many paints and applied finishes. Many materials continue to release or "off-gas" small amounts of a wide variety of chemicals long after they are installed.

Pollutants created by the home's occupants through daily living such as cleaning products, paints and household chemicals which contain solvents and other toxic ingredients that are potentially hazardous (that's why the fine print often says to "use in a well ventilated space").

The effectiveness of the ventilation system which brings fresh air into the home. While ventilation is essential to good indoor air quality, it is also important to reduce the level of chemicals and other pollutants released with the home.

For additional information:
John Broniek, Canadian Home Builders' Association
Tel: 613-230-3060 Fax: 613-232-8214

Build Green Label Launched

Build Green Inc. has been formed by The Greater Toronto Home Builders' Association (GTHBA) to manage the Build Green program. This is a labelling program that will license the use of the Build Green logo to qualified participants including home builders, renovators, manufacturers and retailers.

A Build Green listing service is now available to assist product users and specifiers to identify Build Green products. To products must meet minimum criteria that include:

Recycled Content

The product must contain materials which have served their intended purpose and have been diverted from the solid waste stream for reprocessing. The recycled component can originate from industrial, commercial, institutional or household sources. The "Build Green" product label will contain "Total Recycled Content" as a % of the weight of the product.

Renewable

Products must demonstrate the efficient use of renewable resources. Wood products which utilize resource efficient materials and methods and manufacturers of hardwood products which originate from sustainable managed forests will be eligible for the "Renewable" label.

Technical Criteria

Products must demonstrate current compliance with applicable codes and standards as required in their area of distribution. Products distributed in Canada must meet the requirements of the Canadian Construction Materials Centre (CCMC).

There is no assurance at this time that products eligible for the Build Green label use appropriately recycled content. After all, environmentally sustainable products should also be suitable for their application. The standards for Build Green products may be light, but it does appear to be a positive first step.

For more information
Build Green Inc. Hotline
(416) 391-3454

The New R-2000 Technical Standard: Builders Respond

Why were the technical standards changed?

The R-2000 Program was established in 1980, at a time when the average Canadian home used R20 in the ceilings, R12 in the walls, no insulation in the basement and usually single glazed windows. The R-2000 standard was meant to show how energy efficient houses could be built. The program also stressed the importance of treating the house as a system, by identifying criteria for air sealing, mechanical ventilation and energy efficient space and water heating equipment as well as other combustion appliances.

The impact of the program has been far beyond the actual number of registered R-2000 houses so that there is now less difference between the standard house and the R-2000 house. The option was to let the standard remain as is, until standard practices caught up to R-2000 and the certificate had no special meaning, or to make changes to keep R-2000 as the leading edge of the housing market. It was the second option that was the motivating force to update the R-2000 Technical Standards.

It's a measure of how far the R-2000 program has come that many builders accept it as the standard of good quality and when changes are proposed, rumblings about tough new standards are heard. In other words, "don't rock the boat, we've just got comfortable with the present standards; they work, so why change them?"

The revised R-2000 Technical Standard was introduced in April 1994 after a lengthy review and commentary process with industry. Construction practices, materials and equipment availability and cost benefit analyses were part of the analysis process that went into the decisions for the changes. The main changes were the introduction of environmental features, indoor air quality issues and a tougher energy budget so that today's R-2000 home is about 12% more energy efficient than the same house built to the old standard.

Reactions to the new requirements have been varied - some say it goes too far, while others say it doesn't go far enough. Many recognize that it is a step forward and accept the anticipated growing pains and learning curve that have resulted. However, the change in the energy performance target which has resulted in a decrease in the energy target by about 15% is causing a problem for some, and adding about 2 to 5% to the construction cost, although as Hazen Spinney in New Brunswick put it, "what are you comparing the upgrade to? Construction standards have changed so much in the last few years."

What are the contributing elements to these added costs? What are builders doing to meet the new targets? In most cases it seems to be upgrading above grade wall insulation and basement insulation, and in some cases upgrading the heat recovery ventilator.

Other features that would help meet the targets, such as higher performance windows and higher efficiency mechanical equipment appear to have too high a price increment to always be considered.

It's interesting to note that low-e windows represent a large section of the retrofit window market, but are a very small section of the new house market. In other cases it's a matter that new mechanical equipment is not readily available at a reasonable cost in all markets.

What do builders have to say?

We wanted to find out what builders are saying about the new standard, so we called some builders in various parts of the country. It's interesting to hear their comments about these changes. In many respects, they reflect the climatic, economic, and social differences across Canada. In the east, high energy costs, a weak economy and cold winters mean that operating costs of housing (including the cost of energy) have kept energy efficiency as part of the equation in house buying decision.

Dale Eastman of Clayton developments in Halifax mentioned that "there have been rumblings about the tough new standards, which have meant building envelope upgrades, but we are playing up the positive features - the healthy home aspects and improved indoor air quality features. The parade of R-2000 homes last summer featuring these advanced features was extremely successful and may be repeated again."

In central Canada, the situation is similar, but recently introduced changes to the Ontario building code has created the impression that the gap between code housing and R-2000 has narrowed. However, there is a greater drive to promote environmental responsibility, so there is great interest in the environmental features and some builders want to go further. The Ontario R-2000 Technical committee is even considering adding a renewable energy pick-list.

Minto developments in Ottawa has not found the new standards a major problem, although the incremental upgrade cost means that most R-2000 sales are the larger, move-up and empty nester homes, rather than the starter homes for first time home buyers. Bruce Gough reports that window upgrades (to low-e glass, argon fill, insulating spacer) are the highest ticket item in the upgrades. He said that "the environmental package is easy to achieve, and is not a problem from a cost or marketing viewpoint".

On the prairies, winters are cold but fuel costs are extremely low, so that energy does not rank high in the public mind. Accordingly, energy conservation is not an easy sell. On the west coast, the mild climate and low energy costs also means that energy efficiency is a non starter for most, although environmental issues and indoor air quality concerns are generating interest.

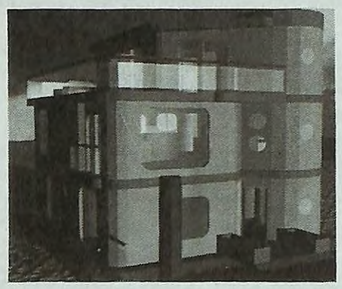
Warren Jones of Cortez Energy Efficient Homes in Vancouver indicated that he's usually built to the level of the new standards, so it's not a problem but then he only builds custom homes so the owner can be sold on the extra features at an early stage. Allan Murray in the Okanagan Valley found that using high efficiency space and water heating equipment helped meet the new targets with only modest changes to the building envelope.

Some builders, primarily custom builders dealing with mid to upper end houses say "Is that all there is to it? The new standards don't go far enough!" But then if you are building custom houses, decisions are often whether to use stainless steel, polished brass or more costly taps, oak or marble floors, or something of that calibre. In that situation, an increment of $2 or 3,000. is not significant. On the other hand, for the couple buying a starter home that is mortgaged to the hilt, every dollar on the purchase price counts.

However, the environmental and indoor air quality features are not seen to be a problem. The move to a more environmentally friendly and healthier home is seen to be very positive. Some think that these requirements don't go far enough as they do reflect a new emerging issue of public concern. Other builders are using these features as their marketing advantage, so that the incremental costs are seen as a marketing cost.

by Richard Kadulski

R-2000 Float Home



And now, for something completely different: a floating R-2000 home! Just another west coast loony idea? Population growth and limited land availability driving people to the water? Not really, just part of a growing band of homeowners who want to live on the water.

(Ironically just as on land, there is a shortage of suitable moorage for float homes).

Warren Jones of Cortez Energy Efficient Homes Ltd (builder of the B.C. Advanced House) is presently building a 2,300 sq. ft. floathome that will be located on a strata water lot on the Fraser River delta in Ladner, B.C.

The Taronia II, as the house has been called, reflects the West Coast lifestyle in it's sensitivity to the local environment and it's practical use of technological innovation. The home will incorporate some of the most advanced techniques for energy efficiency and environmental sensitivity.

Many of the features can be found on any higher end home, including extensive use of ceramic tile, wood flooring and interior glass block, but unlike standard houses, the foundation is a concrete float with foam flotations.

A river-powered turbine will generate electricity for lighting and utility systems. A geothermal heat pump will use river water to provide heat for the home and domestic hot water, and in summer to provide air conditioning. Back up heat will be available from two high-efficiency propane fuelled gas fireplaces.

Good indoor air quality will be assured by the use of low emission cabinets, carpets and paint, to be enhanced by a high efficiency air filtration system.

Recycling Used Materials

Those who live in metropolitan areas are well aware that waste management is a big problem. European developments may foreshadow events here.

New laws in Germany and soon in the rest of the European Community require manufacturers to dispose of their manufactured products after the consumer has finished with them. They have been drafted no doubt by the political considerations of difficulties associated with pollution problems of incineration.

Recycling is not new but until now manufacturers have downcycled scrap plastics. Old windows could be laboriously dismantled and the plastic reused but it was likely to turn up as plastic wood or rigid packing for building materials. The proposed European laws will require that recycled materials are reused to manufacture like products. (i.e. new windows from old windows).

In Germany the replacement of 30 year old vinyl windows is underway. With 100,000 old windows a year being replaced, this is a lot of non-degradable material to dispose of. With vinyl products incineration might be one option but landfill is not as there is simply nothing to rot.

A new plant has been opened in Germany for the specific purpose of shredding, separating and regrinding plastics, windows, roller shutters and doors. Once the windows are broken into fairly small particles, a continuous sorting and grinding process separates the various components. Metal goes to the scrap metal trade, glass back to a float plant and even wood can be reused to manufacture particleboard. Rubber and sundry dust from the process at the moment to be dumped. PVC is reduced to uniform particles of around 3.0 mm, washed, (the water recycled) and re-extruded into pellets that can be used in an extruder.

The process is not free: it costs about $29.00 per window.

The Great Canadian Reno Demo Project

This is the latest progress report of your editor's house renovation project. The work is developing an existing basement area plus addition into a secondary suite in a house built prior to 1911. The site contours mean the addition is a walk-out slab-on-grade section.

This issue we are featuring the Heating and Domestic hot water system used.

The existing mechanical system was typical for Vancouver area houses. Heat was provided by a natural gas furnace installed in the early 1960's and hot water was provided by a gas fired hot water tank, both vented into a masonry flue located in the centre of the house.

The tank and furnace have been removed, replaced by a **Delta-Temp** natural gas fired water heater that will provide both the hot water and space heating needs of the house. This is a new compact high efficiency Canadian designed and manufactured direct vent natural gas fired heater. A conventional electric hot water tank (but not hooked up) has been installed as the storage tank.

The cold water from city mains will be preheated by a passive solar batch water heater that uses no special controls or moving parts (it is a 158 litre tank contained within an insulated glazed solar collector).

The main and upper floor will continue to be heated by a forced air heating system except that instead of a conventional natural gas furnace, an **Energy Savings Products** fan coil blower unit will be used to draw heat off the hot water tank to service the upper suite.

The masonry flue was removed as it is no longer needed and the space has been used as a duct chase to provide ducts to heat the upper floor which never was provided any heat.

The heating system for the new basement suite is floor radiant heating (**Wirsbro** plastic piping). Heat is also taken off the domestic hot water tank through a heat exchanger (so that potable water does not circulate through the floor).

The basement itself is divided into two zones - one for the bedroom and bathroom area on the north-eastern side of the house and the second for the kitchen, living and dining area on the south-west side, which will take advantage of passive solar gains which should contribute about 25% of space heating needs for the house.

A radiant heating system was selected because the finished flooring in the basement will be ceramic tile so we wanted to be able to take the chill off the floor. The split system also provides a complete separation between the suites, thus helping to reduce acoustic problems and cross contamination of smells. It also provides each suite with its own system controls.

An **Eneready vanEE 1000** heat recovery ventilator system with zoned exhaust (**poshtime power grilles** in the bathrooms) will serve both suites to provide continuous fresh air. Ventilation for the upper floors will be tied into the forced warm air system; for the new suite a dedicated supply system is installed.

The estimated annual space heating energy consumption for the whole house will be reduced by 60%, even though the main and second floors are not being renovated at this time, and total finished floor area of the house has been increased by 800 square feet.

Monitoring

Little monitoring has been done for radiant heated floor slabs, even though they are quite common in some areas (in some areas in B.C. even spec built homes have radiant heating installed as a matter of course). That is why B.C. Hydro and CANMET have agreed to monitor the performance of the floor slab.

Over 50 temperature sensors have been embedded in the slab, under the slab insulation, and outside the house in the ground. They will measure temperature gradients across the system. To find out how much insulation is appropriate, two levels of rigid insulation have been used - half the slab has R 12 and the other half has R 20 Styrofoam SM.

Underwriters Laboratories Inc. (UL) of the Unites States is a separate body from ULC (Underwriters' Laboratories of Canada).

UL has now been accredited by the Standards Council of Canada to certify various products to Canadian Standards. Products certified for Canada will carry a UL mark with a C as reproduced here.

Combination Heating System

Lennox Industries Inc. has introduced a high-efficiency combination heating system designed to provide both home and water heating. The Complete-Heat™ system is claimed to achieve a combined annual efficiency (CAE) of 90%. (CAE is the new industry standard for combination heating systems.)

Unlike other combination systems that use a variety of components, here it's all packaged in a single package. When demand for hot water is high, the system dedicates the full heating capacity for water heating. The compact, flexible design, small footprint and multi-position air flow capabilities makes replacement installations easy.

The system consists of two modules; a heating and an air handling module. The heat module is the storage tank which is used for both home heating and domestic hot water. The air handling module is a fan coil unit that provides conditioned air to a forced warm air heating system.

When heat is needed a small pump in the air handler module draws hot water from the storage tank and circulates it through the fan coil. A blower and heat exchanger in the air handling module then transfers the heat from the water to the air, which then heats the home. After the heat has been extracted, the water returns to the storage tank to be reheated.

Venting can be handled vertically or horizontally with 2" PVC pipe, eliminating the need for a separate water heater vent system, or for vertical chimneys or "B" vents.

Space heating capacity: 7 sizes ranging from 40,000 to 120,000 BTU/h. Add-On air conditioning capacity: 1.5 to 5 tons

Water heating: domestic water heating capacity 90,000 or 135,000 BTU/h.

The list price for the unit is about $3,500.

For information:
Your local Lennox dealer or Bill Vale
Lennox Industries Ltd. Etobicoke, ON
Tel: 416-621-9321
Fax: 416-621-8095

Did You Know?

- The average household produces 8500 kg of carbon dioxide each year as a result of energy use in the home? The energy-efficient homes featured at EnviroHome events can cut this pollution by as much as 50%.
- Around half the world's annual glass production, estimated at 80 million tonnes, comes from Europe. Around one-quarter of glass products are produced in the US, while the other quarter is distributed throughout the remaining countries of the world.
- Today's advanced window systems are many times more energy-efficient than those used in the past. If located where they receive sun exposure, the most efficient windows on the market actually gain more heat than they lose!
- The annual energy uses of identically sized refrigerators can vary by more than 50%!

HOT2000 VERSION 7

What is it?

HOT2000 is an advanced approach to the design and modelling of energy efficient structures.

HOT2000 is an easy-to-use micro computer program designed to assist builders, architects and engineers in the design of low-rise residential buildings.

What can it do for me?

HOT2000 lets you input comprehensive data on a proposed building design, analyze the expected heat loss/gain (including cooling loads), and revise and test altered designs until a satisfactory design is achieved.

Contains extensive weather data, models for HRV's, foundations, water heating systems and more.

HOT2000 Sales
c/o CHBA
Ste. 200, 150 Laurier Ave. W.
Ottawa, Ont. K1P 5J4
Tel: (613) 230-3060
Fax: (613) 232-8214

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* Price includes User Manual
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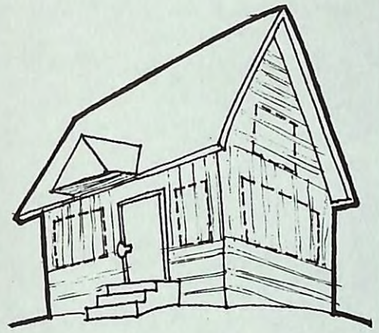

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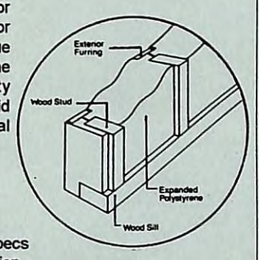

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January 11 - 12, 1995
Ontario Builder Forum 95, Toronto Airport Hilton 24 seminars on energy and environmental concerns, advanced structural alternatives, advanced mechanical systems, business ideas, building science issues. problems and solutions.
Information: Ontario Home Builders' Association, 20 Upjohn Road
North York, ON M3B 2V9
Tel: 416-447-0077; Fax: 416-443-9982

January 14, 1995
Builders' Technical Forum, Sheraton Inn, Guildford, Surrey, B.C. First annual B.C. Builders' Forum will focus on Identifying and Solving Stucco Problems, Home Energy Rating Systems, Doing It Right-Construction Quality Management, Foundation Forming Systems, Environmentally Friendly Building Material, The Healthy House - Practical or Practically Impossible, Advanced Framing Techniques, Steel Stud Framing, High Performance Windows, Top Ten Warranty Problems, Building on Difficult Sites, The User Friendly House - The House of the Future.
Information: Canadian Home Builders' Association of B.C.
3700 Willingdon Ave, Burnaby, B.C.V5G 3H2
Tel: 604-432-7112; Fax: 604-432 9038

January 25-26, 1995
Enerhouse '95 Halifax, N.S. 16 sessions on energy and housing issues, product exhibits, tour of Sustainable Housing Competition winner. Presentations Include: Safe, effective ventilation, Rethinking how you build, Air sealing made easy, New window technology, New concrete forming systems, Heating systems for today's homes, Healthy Housing, National Building Code changes
Information: N.S. Dept of Natural Resources, Box 698, Halifax, N.S. B3J 2T9
Tel: 902-424-5727; Fax: 902-424-7735

January 29 - February 1. 1995
CHBA National Conference
Halifax, N.S. Information: Canadian Home Builders' Association, Suite 200, 150 Laurier Ave. West, Ottawa, ON K1P 5J4
Tel: 613-230-3060; Fax: 613-232-8214

March 8 - 11, 1995
1995 (EEBA) Excellence in Housing Conference Minneapolis, Minnesota Technical papers, case studies, interactive session,s panel discussions on Building Envelope, Building Science, Mechanical systems, Indoor Air Quality, Resourceful Building Technologies, Energy Supply and Management
Information: EBBA, 1829 Portland Avenue, Minneapolis MN 55404-1898
Tel: 612-871-0413; Fax: 612-871-9441

April 7 - 8, 1995.
Building & Remodelling In The 90's: Building Better, Building Green Bangor, ME Seminars and exhibits covering critical issues of the 90's, facing the environment, architects, builders, and homeowners. Held at Eastern Maine Technical College's Bangor, Maine
Information: Voice 207-561-4000; Fax 207-941-0938

Building Envelope Performance and Durability
One day seminar covering control of heat, air and moisture in walls and roofs; controlling entry of rain, snow and ice; assessing window systems; designing durable joints; principles of good design. Presented by National Research Council's Institute for Research in Construction.
Feb. 3, 1995 Ottawa, ON; Feb 6, 1995 Winnipeg, MB; Feb. 8, 1995 Edmonton, AB; Feb. 10, 1995 Calgary, AB; Feb. 13, 1995 Vancouver, BC; Feb. 21, 1995 Toronto, ON; Feb. 27, 1995, Halifax NS; Mar 1, 1995, Moncton, NB; Mar 3, 1995, St. John's, NF; Mar 15, 1995, Montreal, PQ; Mar 17, 1995, Quebec, PQ.
Information: IRC, tel 613-993-0435; Fax 613-952-7673

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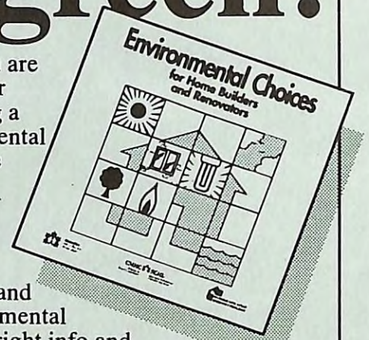

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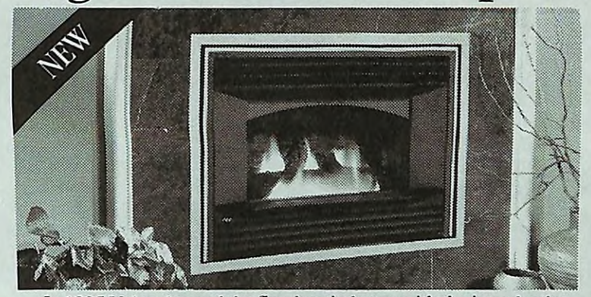

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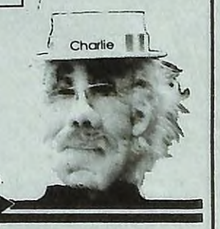

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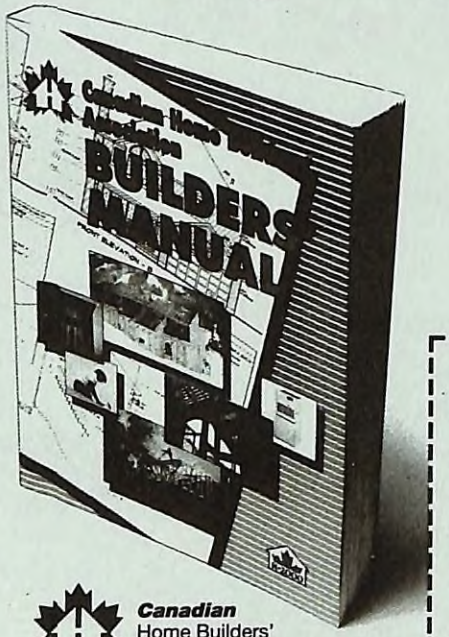

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